GITAN: Global Integrated Trends Analysis Network

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Presentation to the USGS Global Change Workshop

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U.S. Department of the Interior
U.S. Geological Survey

What is GITAN?

- A multidisciplinary *network* of collaborators interested in understanding the types, causes, and consequences of change on the landscape
- An ecoregion-based *framework* for global planning and management applications
- A global *data development and analysis* effort
- An *advisory resource* for other networks and processes such as IABIN, GEOSS, the Conservation Measures Partnership, tracking the UN Millennium Development Goals, etc.

Why GITAN?

Rapid landscape change

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Rapid technological change

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Increased demand for data and informatics tools

= *GITAN*

GITAN Approach

1. ***Build*** **consortium-based** ***partnerships*** **between contributors and users**

2. ***Develop information resources*** **(satellite imagery and land use, biophysical and socio-cultural data, change and trends analyses, supporting plot-level datasets, etc.) for each of the 825 global terrestrial WWF ecoregions**

3. ***Deliver information resources*** **into the public domain on the web and in DVD formats**

4. ***Leverage the information resources*** **as essential components of global, continental, and regional earth observation and conservation monitoring programs (IABIN, GEOSS, etc.)**

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GITAN – Partners

- USGS
  - *Geographic Analysis and Monitoring Program (GAM)*
  - *Terrestrial, Freshwater, and Marine Ecosystems Program*
  - *Wildlife and Terrestrial Resources Program*
  - *Land Remote Sensing Program*
  - *Earth Surface Dynamics Program*
  - *National Biological Information Infrastructure (NBII)*
  - *EROS Center*
  - *Rocky Mtn Geographic Science Ctr*
- USEPA
- USFS
- NOAA
- USAID
- NASA
- National Governments (typically Ministry of Environment)
- Birdlife International
- World Conservation Monitoring Centre (WCMC)
- The Nature Conservancy (TNC)
- Conservation International (CI)
- World Wildlife Fund (WWF)
- Heinz Center
- World Resources Institute (WRI)
- Guyra Paraguay
- EcoAgriculture Partners
- IUCN
- Industry

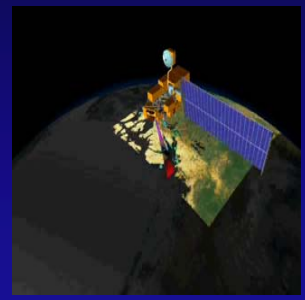
GITAN Working Scales

- Global
- Regional

  Ecoregions
  Countries

- Local

  Sampling Blocks (10 X 10 km blocks)
  Sample Plots (STEP database)



GITAN Core Information Resources

1. Satellite Imagery
2. 90 m Digital Elevation Data
3. Elevation Classes
4. Landforms
5. Landcover Maps
6. Landuse/Landcover Change Maps
7. Landscape Trends Analysis
8. Fragmentation Analysis
9. Ecosystems Maps and Ecosystems Services Analyses
10. Soils
11. Climate Data
12. Protected Area Data (WDPA)
13. Plot-based Measurements (STEP Database)

For each of the 825 Global Terrestrial Ecoregions (WWF, 2003)

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GITAN – Key Thematic Components

- Landscape Status and Trends
- Modularized Indicators
  - Biodiversity (Species and Ecosystems)
  - Hydrological
  - Agricultural Production
  - Human Behaviors/Threats
  - Soil
- Global Data Tools
- Ecosystem Mapping and Analysis

GITAN – Example Indicators and Trends Metrics

Land Cover, Land Use, and Ecosystems

- Forest and Land Cover
- Percent Tree Cover
- Impervious Surface
- Land Cover Change
- Ecosystem Change

Landscape

- Patch Size distribution
- Patch Vulnerability
- Patch Fractal Dimension (area/perimeter ratio)

Protection

- Percent of ecoregions/ecosystems under protection

Threats

- Change in Land Use and Land Cover within and surrounding protected areas
- Urbanization in proximity to protected areas
- Change in vegetation phenology within and surrounding protected areas

Water

- Changes in surface water extent

Socio-economic

- Population change and pressure

USGS

Ecosystem Modeling

What is an ecosystem?

Mappable, co-occurring assemblage of plants and animals that share common ecological processes and biophysical characteristics

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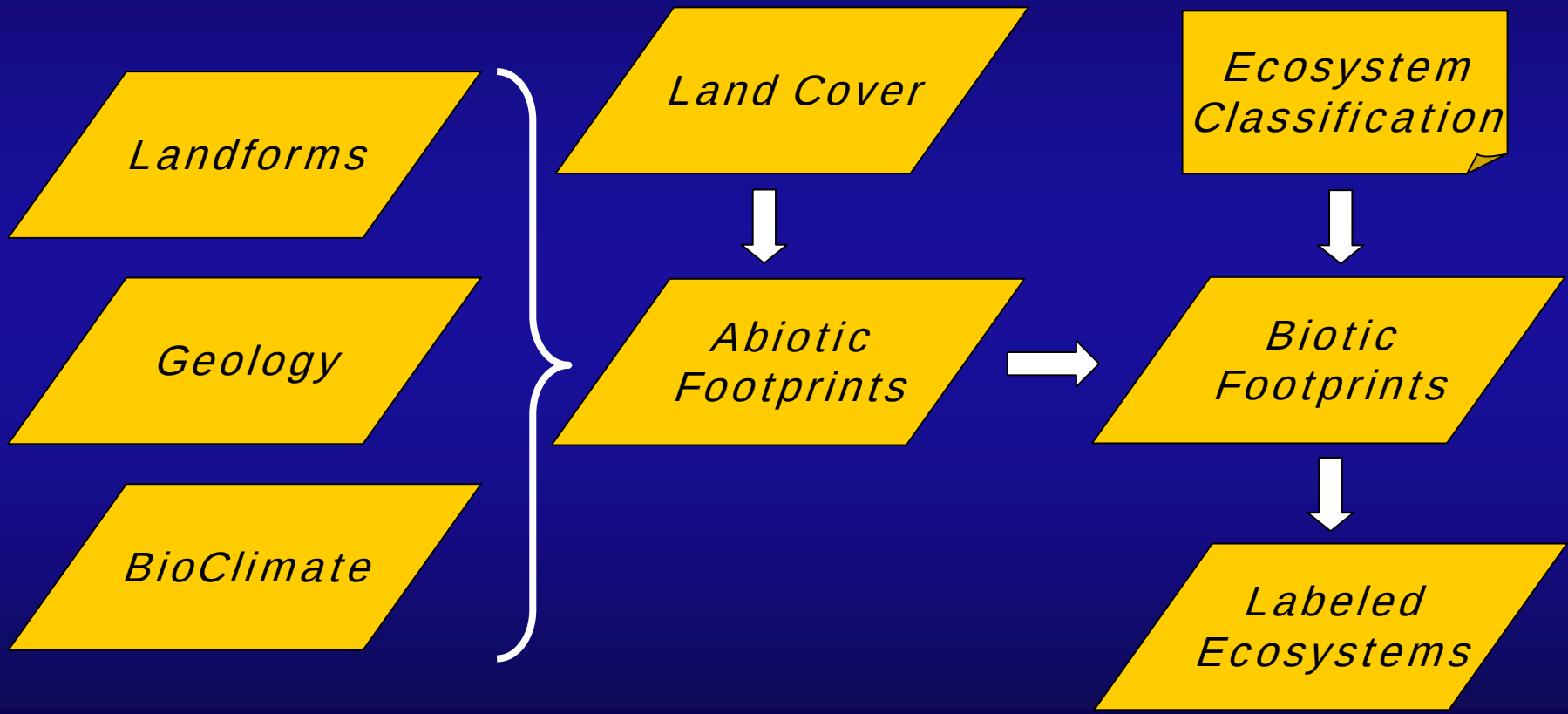
Why Model Ecosystems?

1. Create a framework for scientific monitoring of landscape trends
2. Provide resource managers and policy makers with information
3. Provide baseline information to calculate the value ecosystem services

Ecosystem Mapping Model:



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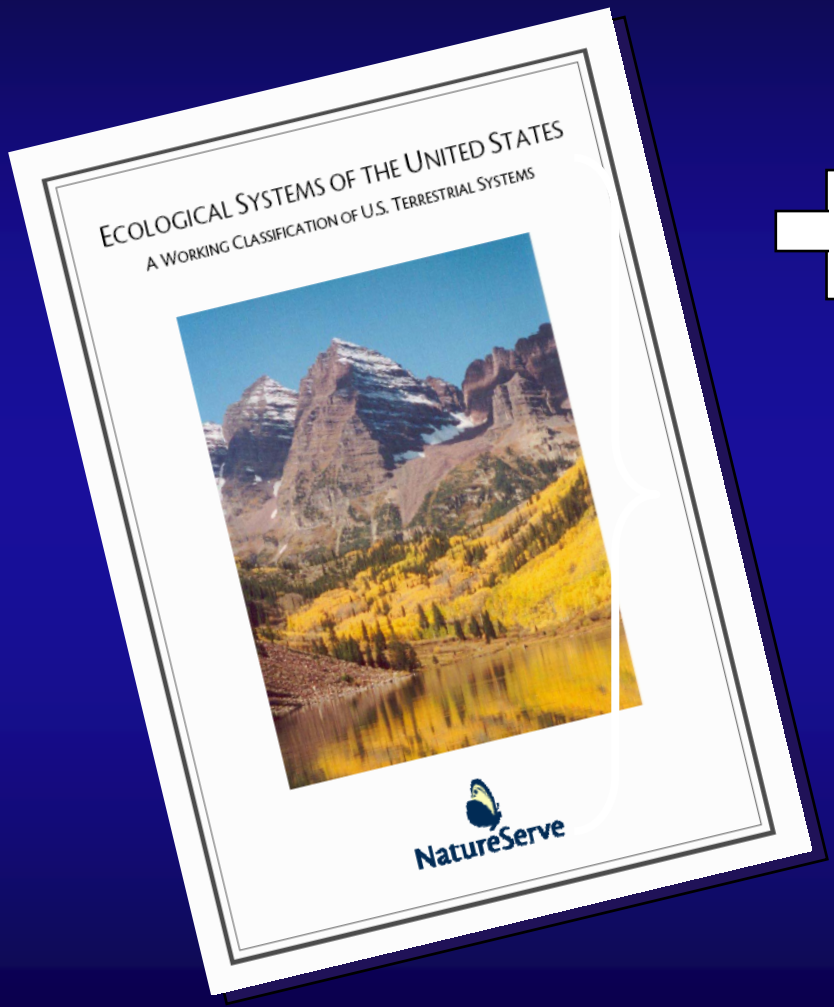
U.S. Ecosystem Classification



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Biotic Footprints

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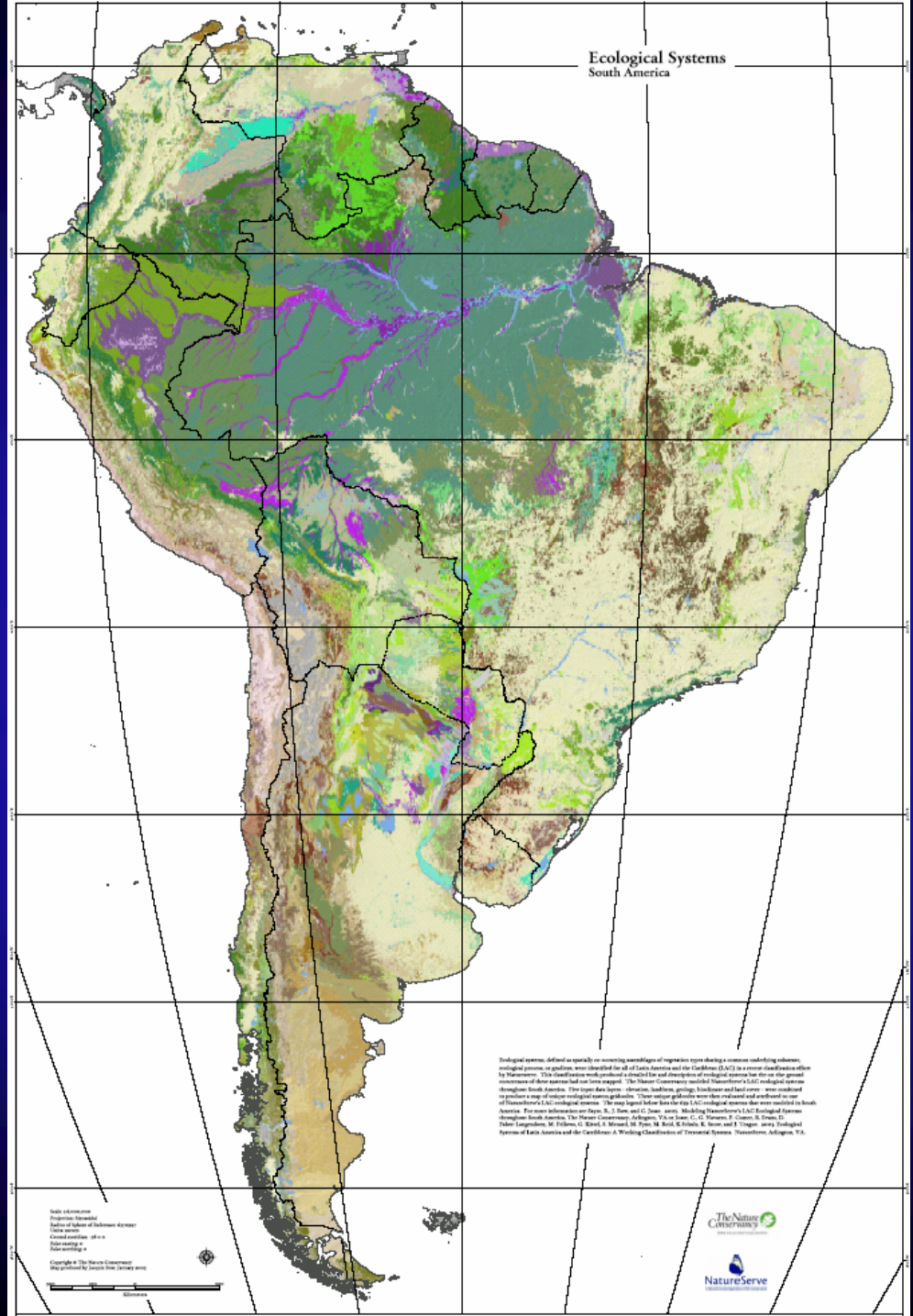
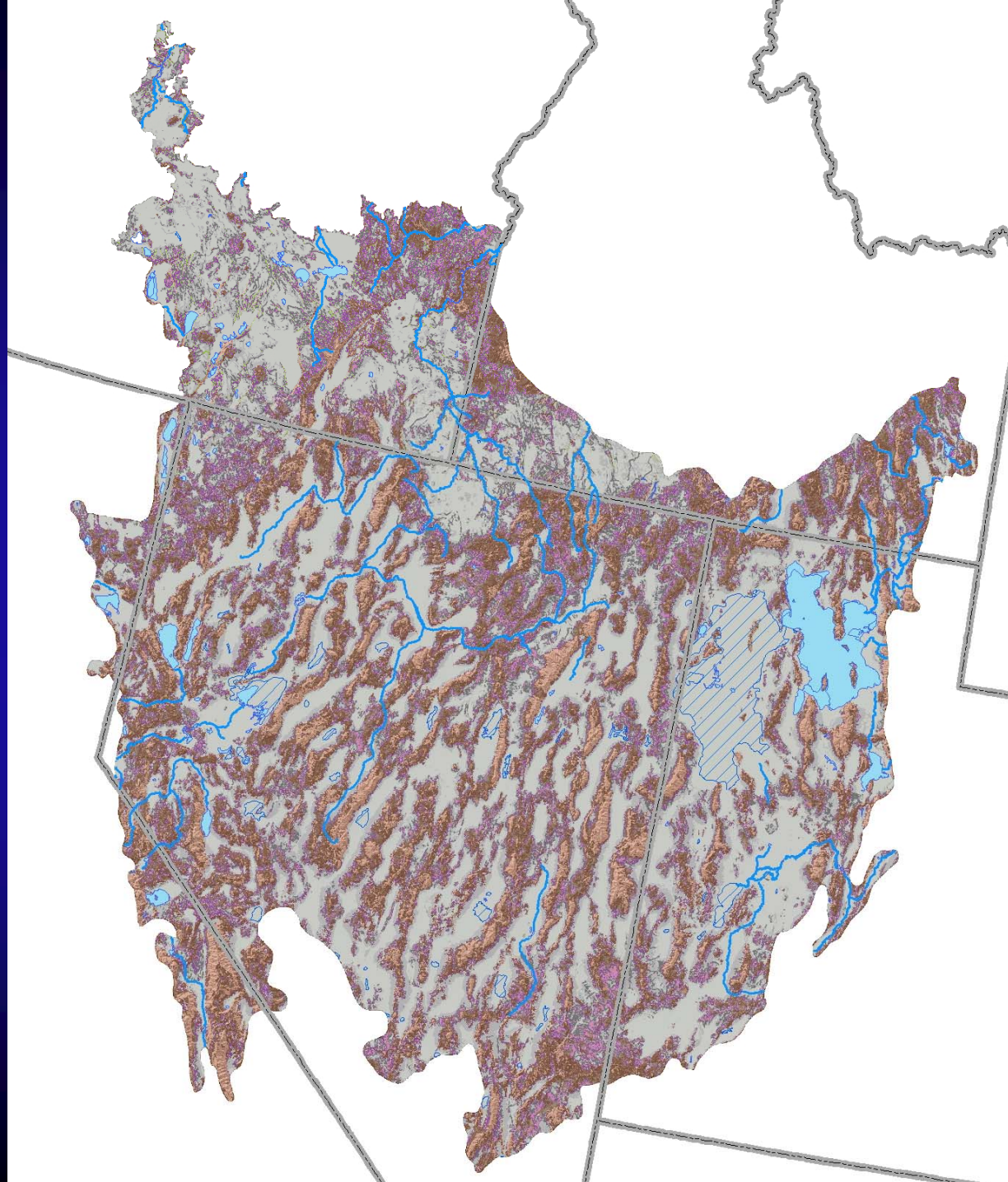
Labeled Ecosystems

USGS

- *657 terrestrial ecosystems*
- *Not ground-truthed*
- *Good congruence with Colombia, Brazil, Paraguay, Bolivia ecosystem maps*
- *450m working resolution*
- *Regional context for national ecosystem maps*
- *Standardized framework for cross walking other maps*



Landforms for the Great Basin



GITAN – Pilot Ecoregions

Appalachian/Blue Ridge
Mixed Mesophytic Forest

Great Basin

Senegal
- West Sudanian Savanna
- Guinean Forest-Savanna

Cambodia
- Cardamom Mountains Rainforests
- Southeastern Indochina Dry Evergreen Forests

Paraguay
- Arid and Humid Chaco

GITAN

Global Integrated Trends Analysis Network

GITAN Initiative in PARAGUAY

Understanding landscapes changes in the historical procces of expansion of agricultural frontier in Paraguay and the relationship with regional and global tendences

With the support of:

Asociación Guyra Paraguay
Servicio Geológico de los Estados Unidos
Secretaria del Ambiente
Proyecto PAR98/G33 - Paraguay Silvestre
Programa de las Naciones Unidas para el Desarrollo

GUYRA PARAGUAY

USGS science for a changing world

Secretaría del Ambiente

paraguay silvestre

PNUD

Paraguay Approach

Include all of the essential elements of GITAN

Landcover Mapping

This work will involve the acquisition and analysis of satellite images to build a national land cover database for several time periods. A catalog of available image scenes will be compiled for the following epochs: 2003, 2000, 1995, 1990, 1985, 1980, pre-1980

Landcover Trends Analysis

Changes in landcover will be analyzed using the five-year national land cover maps,.

Ecosystems Mapping and Analysis

Ecosystem mapping will be verified in the field by collecting sample plot data from multiple locations within each ecosystem. Guyra Paraguay and partners will conduct the accuracy assessment and collect field data for verification

Field Verification

Both the landcover mapping and ecosystems verification activities require representative field sampling in every ecosystem type or landcover class. In addition to serving as the basis for local classification efforts, the plot data will contribute to the Global Plot Database of GITAN

Important Bird Areas – Key Biodiversity areas

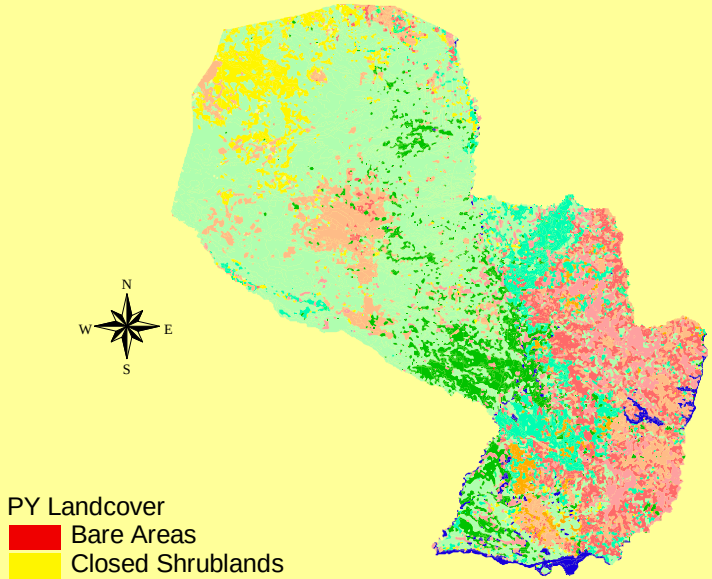
Guyra Paraguay will identify and develop Important Bird Areas (IBAs) for the nation. One of the globally available tools offered by GITAN is the “IBA Mapper”. These IBAs characterizations will be provided to Birdlife International as a contribution to the list of candidate IBAs

Indicators Development

Based on discussions with the Government (SEAM) and other stakeholders, USGS and Guyra Paraguay will identify 3-5 practical indicators describing landscape change that can be derived using the landcover trends analysis, ecosystem map, and other available biophysical and social datasets

Paraguay Initial Pilot Projects

- *GAP analysis of protected areas in Paraguay*
- *Rapid landcover classification*



PY Landcover

- Bare Areas
- Closed Shrublands
- Closed Steppe grasslands
- Closed Steppe Grasslands
- Converted Vegetation
- Degraded Vegetation
- Periodically Flooded Savannah
- Shrub Savannah
- Sparse Herbaceous
- Tree Cover, Broadleaf Deciduous
- Tree Cover, Broadleaf Evergreen
- Unknown
- Water

Gap analysis of protected areas in Paraguay

- *Produce a gap analysis that documents the representation of Paraguayan terrestrial ecosystems in the national protected area system of that country*
- *Enhance access to georeferenced, documented biodiversity data for protected areas throughout Paraguay*
- *Build capacity for conducting ecological analyses in Paraguay.*
- *Support the work of Inter-American Biodiversity Information Network (IABIN) and the Global Integrated Trends Analysis Network (GITAN) partners in the Americas*
- *Contribute toward international biodiversity initiatives*

Work Plan

- ***Combination of two national, spatial data layers: standardized terrestrial ecosystems and official protected areas***

- ***Every ecosystem in the country will be assessed and labeled either as:***

  a) not-protected (none of its area is protected area status (0 %)

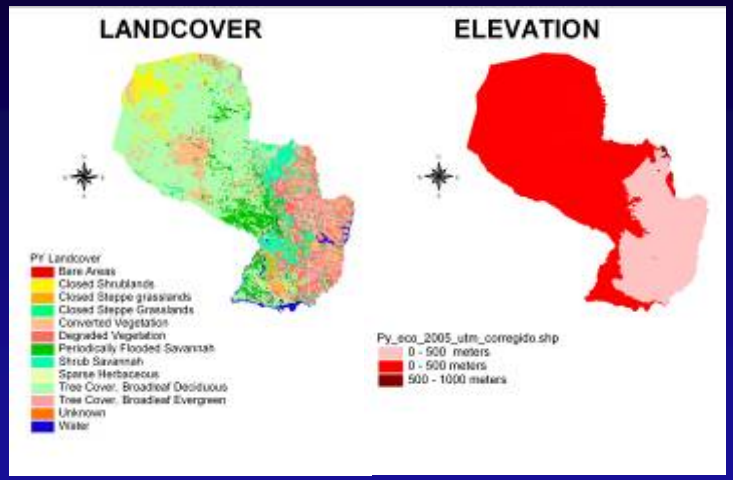
  b) poorly protected (< 5 %)

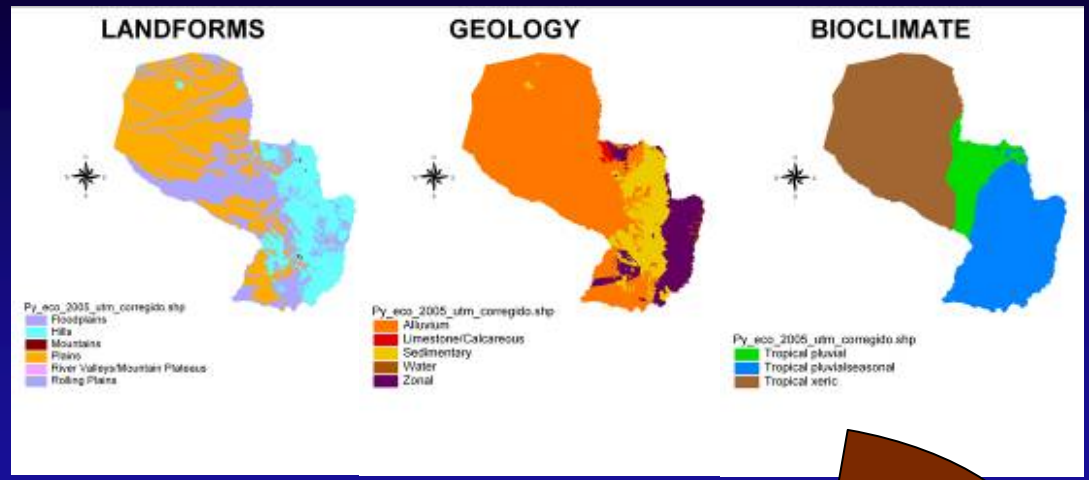
  c) moderately protected (6 – 10%)

  d) well-protected (> 10%)

Total surface area of all of the occurrences of the ecosystem is in protected area status

Data sources and process



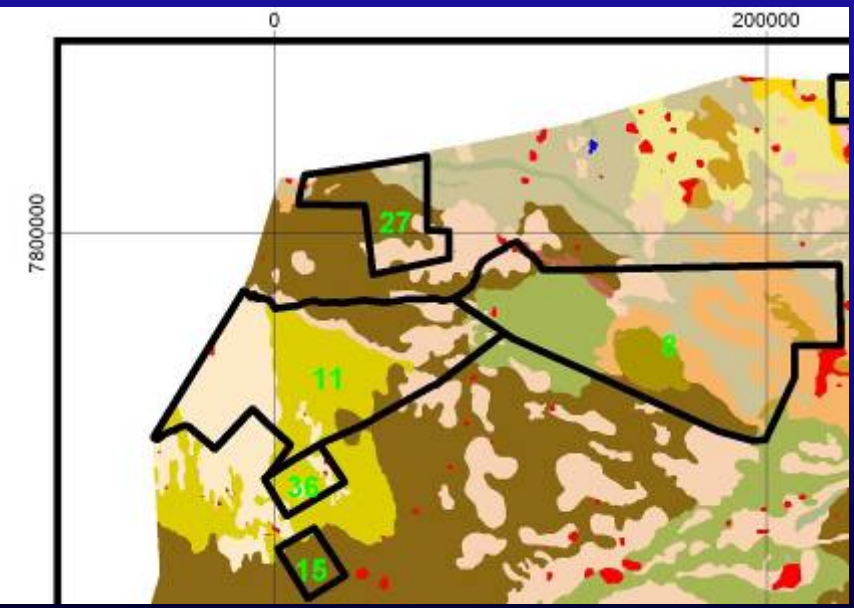


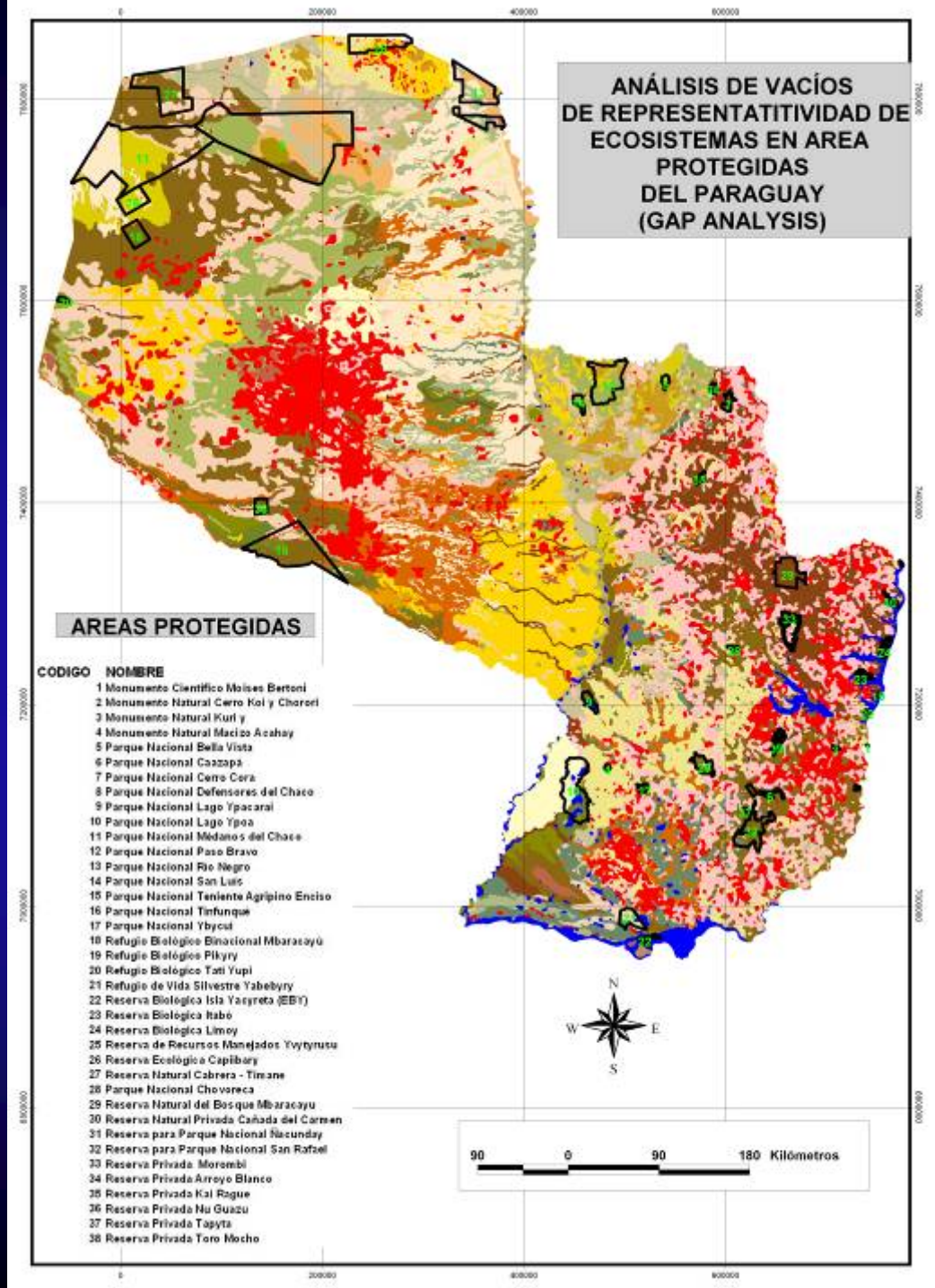
ECOSYSTEMS FOOTPRINTS

LABELED ECOSYSTEMS

Results

- *A dynamic geodatabase named version 1.0*
- *Ready to use by decision makers*
- *Ready for use in field works*
- *Ready to build scenarios*
- *Ready to use as input for GAP analysis of species*

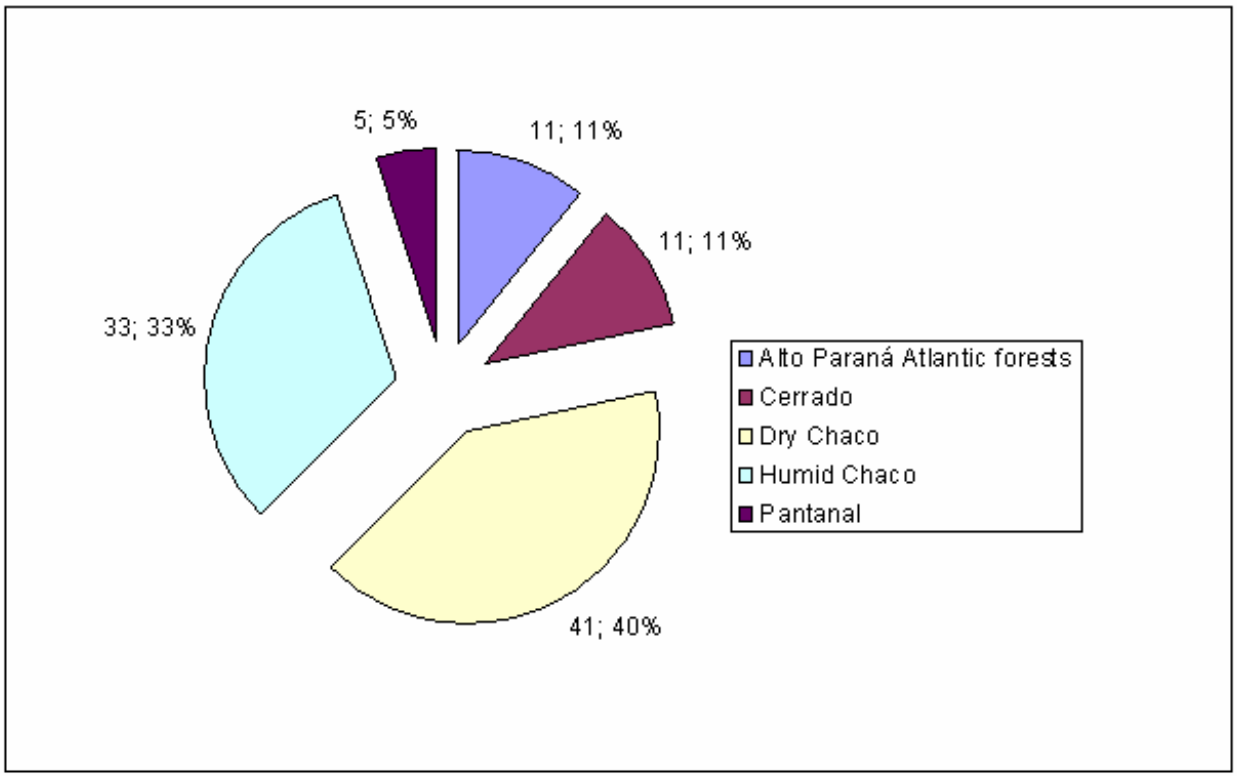




Results

NUMERO DE ECOSISTEMAS IDENTIFICADOS PARA CADA ECOREGION EN PARAGUAY
IDENTIFIED ECOSYTEMS/ECOREGION IN PARAGUAY

ECOREGION	NUMERO DE ECOSISTEMAS/NUMBER OF ECOSYSTEMS
Alto Paraná Atlantic forests	11
Cerrado	11
Dry Chaco	41
Humid Chaco	33
Pantanal	5
TOTAL	**101**



- *101Ecosystems labeled (based on Nature Serve systems)*
- *5 Ecoregions defined*
- *7% percent of total remaining ecosystems area for the country in protected areas**
- *High percentage of ecosystems with 0 protection level*

**** UNESCO Biosphere reserves and RAMSAR sites not considered in the first analysis***

United States/Great Basin Pilot

- National ecosystem mapping project
- Great Basin = Pilot site for ecosystem mapping
- USGS Integrated Landscape Monitoring Pilot
  - Conceptual Modeling
  - Landscape Change Monitoring Monitoring
  - Work with Decision-makers
- Ecosystem Portfolio
  - Landcover
  - Landcover Change Analysis
  - Landcover Trends
  - AVHRR/Greenness Data

Senegal/West Africa Pilot

- Cooperative USGS/USAID/FAO/Senegal project
- Biodiversity and Natural Resource Monitoring
- Landcover change mapping
- 2006 wall-to-wall landcover mapping product
- West Africa Land Cover Applications Program

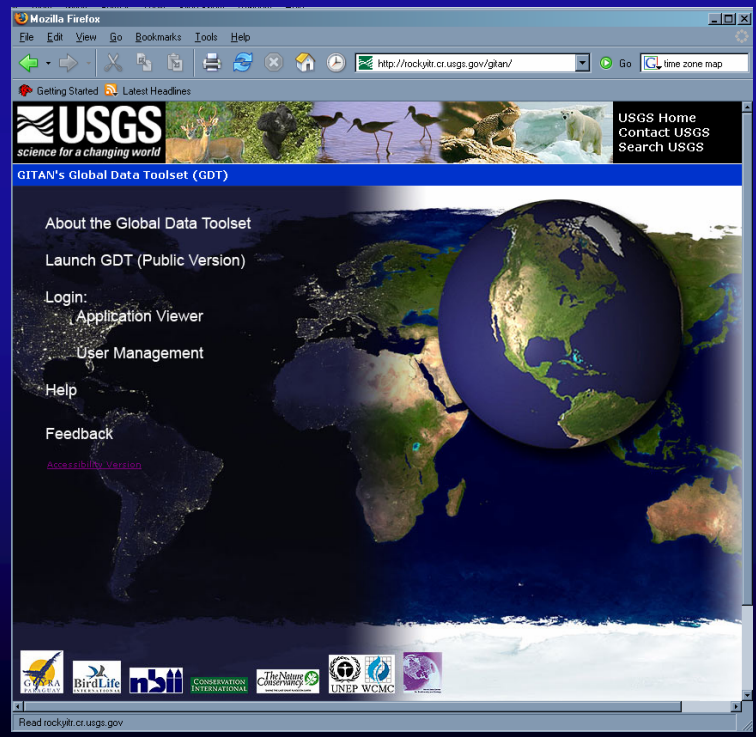
1984

1992

USGS

Global Data Tools

- http://rockyitr.cr.usgs.gov/gitan/
- Global Data Sets
- Web-enabled management tools



Status of GITAN

- Priority for GAM Program
- Global Data Tools
  - Global Database
  - Web-enabled Data Tools
- Ecosystems
  - United States
  - Global Ecosystems Classification
- Pilots
  - Great Basin
  - Paraguay
  - Senegal/West Africa

Relationship of GITAN to Global Climate Change Research

Ecosystem Mapping:

- **Thematic & Spatial Framework**
  - Global Change Monitoring
  - Carbon Budgets
- **Global Data Tools**
  - Data warehouse for ecosystem data
  - Web-enabled tools for practitioners

USGS